



# CITY OF LODI

## COUNCIL COMMUNICATION

**AGENDA TITLE:** Professional Services Agreement with Power Engineers Inc. for Engineering Study at Killelea Substation (\$32,000)

**MEETING DATE:** June 7, 2000

**PREPARED BY:** Electric Utility Director

**RECOMMENDED ACTION:** That the City Council authorize the City Manager to enter into a professional services agreement with Power Engineers, Inc. for an engineering study based on Power's proposed Work Plan and Budget. The engineering study, in an amount not to exceed \$32,000, will identify feasible cost-effective rebuild options and associated costs for the Killelea Substation upgrade project.

**BACKGROUND INFORMATION:** The Killelea Substation was constructed in 1965. The 12 kV section is a metal clad type enclosed switchgear. The manufacturer of this equipment is no longer in business making parts extremely difficult to locate. The design of this switchgear is such that a failure of one portion of the insulated bus likely would escalate throughout the entire switchgear making a failure catastrophic resulting in a total loss of the station. The age and condition of the insulation material makes the likelihood of a failure greater with each passing year. The 60 kV bus structure was the interconnection facility as well as the main 60 kV distribution structure prior to the construction of Industrial Substation. A large portion of this structure is no longer needed and adds unnecessary exposure to the City's electric system. This station was envisioned to be phased out of service with the construction of Industrial Substation. However, with the significant industrial growth on the east side of the City this station will remain a vital part of the City's distribution system and will require reconstruction to remain a reliable and dependable substation.

The study recommended here will identify the various available configuration options, maximum of four, for reconstruction of the station and will evaluate and provide cost estimates for each option. In addition the study includes an evaluation of the condition and expected remaining life of each of the two power transformers based on a series of tests to be performed on each unit. It is expected that both units will be available for use in the reconstructed station. Upon completion of this study the Department will be able to select the most advantageous option and will at that time return to the City Council with a recommendation to proceed with the design followed by bidding and construction. The reconstruction project is expected to be completed and on line in the Spring of 2002.

**FUNDING:** Included in the 1999-2001 Financial Plan and Budget (Page E28 and E29)  
(Ref: Special Allocation #84, JV #20995, dated 3/8/2000)

**FUNDING APPROVAL:** Vicky McAthie  
Vicky McAthie, Finance Director

Alan N. Vallow  
Alan N. Vallow  
Electric Utility Director

Prepared by: Hans Hansen, Manager, Engineering and Operations

c: City Attorney

**APPROVED:** Janet S. Ketur for DF  
H. Dixon Flynn - City Manager



May 10, 2000

Mr. Hans Hansen, PE  
City of Lodi  
1331 South Ham Lane  
Lodi, California 95242

Subject: 120766-01      Killelea Substation Upgrade Engineering Study  
Work Plan & Budget

Dear Hans,

We are pleased to be provided the opportunity to work with the Electric Utility Department (EUD) on the proposed upgrade to the existing Killelea substation. The purpose for upgrading the Killelea substation is based on EUD's concerns with reliability and the operational limits that currently exist at the substation. At one time it was thought that the Killelea substation might be eliminated from the City of Lodi's transmission system if the Industrial substation could pick up the Killelea load. The City has determined that the growth and load demands on the east side of Lodi preclude eliminating Killelea substation from the City's system, therefore, it has been decided to pursue the necessary upgrades to improve the reliability and operations of the Killelea substation.

POWER's Randy Pollock PE, Lan Alder and John McGrew attended a meeting in Lodi on April 3, 2000, to discuss the upgrade project. Hans Hansen, Mel Grandi, Jess Kerekes and John Sprouse attended for Lodi. At the meeting we discussed the proposed work as outlined in an EUD handout titled Killelea Substation Rebuild (Attachment 2). After the meeting POWER, Hans Hansen and Jess Kerekes traveled to the substation site. POWER's work plan and budget, as outlined herein, is based on our discussions at this meeting and our observations of the Killelea substation site.

### *WORK SCOPE UNDERSTANDING*

POWER's scope of work is based on performing a study to determine feasible cost-effective rebuild options for the Killelea substation. POWER will consider both highside (60kV) and lowside (12kV) options for the substation. POWER will consider the advantages of changing the layout of the substation and the transmission line entries inside and outside the existing substation property owned by the City.

POWER will investigate reconstruction alternatives for the highside. Currently the highside of the station is designed as a main and transfer bus with six breakers. The planned use for the substation considers one line in and one line out. The existing highside bus configuration can be simplified to accommodate one line in and one line out, including options for reconstructing the highside structure that would eliminate four breakers. Furthermore, consideration will be given to replacing oil circuit breakers with gas breakers. All applicable items listed in the attachment will be addressed in the study.

The existing 12kV metal-clad distribution equipment needs to be replaced. The existing switchgear does not provide the sectionalizing capability that EUD requires for operating the equipment. Also, it is difficult to replace parts because of the age of the switchgear. Furthermore, EUD desires to replace the electromechanical relays with solid state digital relays.

We understand the required energization date of the re-built substation to be in the Spring of 2002.

## *WORK PLAN*

### **Task 0 – Project Management**

Manage and administer POWER's personnel and resources during the course of the study. Provide monthly status reports with the invoice. The status reports will address the progress of the study as well as the planned activities for the upcoming month.

### **Task 1 – Data Acquisition**

POWER's Randy Pollock, Lan Alder and John McGrew traveled to the City on April 4<sup>th</sup> to meet with EUD to review the project and to visit the Killelea Substation. POWER gathered drawings, data and information on this trip. The cost of this trip, except for Randy Pollock, is included in this task.

### **Task 2 – Conceptual Layouts**

Develop feasible conceptual layouts for EUD's review. Conceptual layouts will consider both metal clad switchgear and 12kV open bus. Orientation of the substation will consider the best use of the property for bringing the transmission in and out, and operating and maintaining the substation. The layouts will include the entry and exit of the transmission lines and distribution feeders, highside bus, transformers, control building, oil containment, conduit systems, both lowside open bus and metal-clad switchgear. Consideration will be given to expanding the substation to the west onto private property as an option if deemed reasonable, given the configurations being investigated.

It is anticipated that there will be a minimum of two, a maximum of four conceptual layouts. The conceptual layouts will be produced as dimensioned AutoCAD general arrangement drawings. The drawings will be forwarded to EUD for review and comment. A teleconference call will be scheduled to review EUD's mark-ups and comments. Changes will be agreed upon and drawings will be marked up accordingly.

### **Task 3 – Final Drawings & Cost Estimates**

Develop a minimum of two, a maximum of four final general arrangement and section drawings of the selected options. Prepare detailed cost estimates for each option. Cost estimates to include engineering, design, procurement, land acquisition (if applicable), equipment and material costs, construction, construction management and commissioning. Cost estimates to include cost of a block wall, or other type of concrete wall for the perimeter fence to compare with the cost of a chain link fence. Oil containment options will be considered for the transformers in the cost estimates.

### **Task 4 – Report**

Prepare a draft report that includes a brief narrative description of each option including advantages and disadvantages for each option. Cost estimates generated from Task 3 will be compared for each option. Based on the costs and consideration of the advantages and disadvantages of each option POWER will make a recommendation for the preferred configuration.

The draft report will be forwarded to EUD for review and comment. A meeting will be scheduled with EUD in EUD's office to go over EUD's comments. All agreed upon changes will be made and a final report will be issued.

#### Engineering Study Deliverables:

- Conceptual General Arrangement Drawings in AutoCAD (minimum 2, maximum 4)
- Final General Arrangement and Section Drawings in AutoCAD (minimum 2, maximum 4)
- Detailed Cost Estimates for the selected options (minimum 2, maximum 4)
- Draft Report (Text with drawings)
- Final Report (Text with drawings)

### **Task 5 – Transformer Testing (Optional)**

The description for this task is included as Attachment 1.

The existing transformers are presently in good operating condition, and previous testing has shown them to be operating within acceptable parameters. However, due to the expense of rebuilding and upgrading the Killelea substation, and due to the age of the existing transformers, we recommend that a complete series of tests, as described in the attachment, be performed on both transformers. Should the tests indicate any areas of concern, there will be ample time to determine if the concerns can be remedied or if new transformers will be required.

### *SCHEDULE*

The conceptual layouts will be forwarded to EUD for review and comment six weeks after receiving notice to proceed. POWER will forward the draft report four weeks after receiving EUD's comments. POWER will the issue final report within two weeks after receiving EUD's comments on the draft report.

### *BUDGET*

POWER's estimated man-hours, labor and expenses for performing the work outlined in this letter is as follows:

	Task	Hours	Labor (\$)	Exp (\$)	L&E (\$)
0	Project Management	29	2553	250	2803
1	Data Acquisition	20	2060	1650	3710
2	Conceptual Layouts	76	5469	560	6029
3	Final Drawings & Estimates	84	6456	660	7116
4	Report & Design Review	60	5426	1749	7175
5	Transformer Testing (Optional)	--	--	--	5029
<b>Project Total</b>					<b>31,862</b>

City of Lodi  
May 9, 2000  
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POWER proposes to perform the work on a time and expense basis per the attached Schedule of Charges for the estimated amount of \$31,862. POWER will not exceed this estimated amount without prior approval from EUD. If it is determined early in the study process that there will be less than four conceptual designs then it is probable that POWER will be able to complete the work for less than the estimated amount.

If you have any questions or comments please call Lan Alder or myself.

Sincerely,  
POWER Engineers, Inc.



John McGrew  
Project Manager

JM/be  
Sent Via: Fed-Ex  
cc: Randy Pollock (POWER)  
Jeff Mann (POWER)  
RM 120766-01/File

**ATTACHMENT 1  
CITY OF LODI  
KILLELEA SUBSTATION**

**TASK 5 - TRANSFORMER TESTING (OPTIONAL)**

**TRANSFORMERS - Liquid Filled**

**Visual and Mechanical Inspection**

Compare equipment nameplate information with single-line diagram.

Inspect for physical damage, cracked insulators, leaks, tightness of connections, and general mechanical and electrical conditions.

Verify proper auxiliary device operation.

Check tightness of accessible bolted electrical connections.

Check for proper liquid level in all tanks and bushings.

Perform specific inspections and mechanical tests as recommended by manufacturer.

Verify proper equipment grounding.

**Electrical Tests**

Perform insulation-resistance tests, winding-to-winding, and windings-to-ground, utilizing a megohmmeter with test voltage output. Test duration shall be for 10 minutes with resistance's tabulated at 30 seconds, 1 minute, and 10 minutes. Calculate dielectric absorption ratio and polarization index.

Perform a turns-ratio test between windings at all tap positions. The final tap setting is to be determined by the owner/user's electrical engineer and set by the testing firm.

Sample insulating liquid in accordance with ASTM D-923.

Sample shall be laboratory tested for:

Dielectric breakdown voltage: ASTM D-877 or ASTM D-1816

Acid neutralization number: ASTM D-974

Specific gravity: ASTM D-1298

Interfacial tension: ASTM D-971 or ASTM D-2285

Color: ASTM D-1500

Visual Condition: ASTM D-1524

Power factor: ASTM D-924

Water content: ASTM D-1533

Perform dissolved gas analysis (DGA) in accordance with ANSI/IEEE C57.104 or ASTM D-3612.

Measure total combustible gas (TCG) content in accordance with ANSI/IEEE C.57.104 or ASTM D-3284.

Perform insulation power-factor tests or dissipation-factor tests on all windings and bushings. Determine overall dielectric-loss and power factor (CH, CL, CHL). Test voltages should be limited to the line-to-ground voltage rating of the transformer winding.

Perform individual excitation current tests on each phase.

Perform winding-resistance tests on each winding in final tap position.

Perform tests and adjustments on fan and pump controls and alarm functions.

#### **CLARIFICATIONS:**

1. The City of Lodi, will provide qualified electrical persons to work with POWER's personnel for the purpose of providing access to equipment, facilitate production and as required by local union rules and codes to work with POWER's on site test engineers.
2. The transformers are to be tested during normal business hours.

#### **REPORT:**

POWER has developed an extensive library of test report forms that cover all types of equipment. These forms have been prepared to identify the location, nameplate data, and all critical points of inspection and test data for each piece of equipment. Use of these forms will provide client with an easy-to-read, consistent, and detailed record of the acceptance testing of the electrical equipment.

Reports for the acceptance testing will include the following sections:

##### **Summary of Findings**

- A brief summary of the scope of the project that outlines the work performed, any significant problems found and any recommendations made.

##### **Equipment Description**

- A brief summary of the types of equipment tested and calibrated.

##### **Test/Acceptance Procedures**

- A brief description of the methodologies and procedures used for the project.



**Results and Recommendations**

- A detailed narrative description of the results of the testing and maintenance, any problems found, corrective measures taken, and any recommendations.

**Test Data Sheets**

- A complete copy of each test data form used.

**PRICE:**

POWER Engineers, Inc. has estimated the price to perform the acceptance testing of the equipment scope defined can be provided for:

**Five thousand, twenty nine dollars .....\$5,029.00**

**ATTACHMENT 2  
CITY OF LODI  
KILLELEA SUBSTATION  
REBUILD**

**Goal:** Recondition Killelea Substation. Replace existing 12kV metal-clad distribution equipment. Reconstruct 60kV section and eliminate equipment no longer required. Construct oil retention system. Eliminate existing 12kV cable trench and install conduit duct systems.

**Operating requirements:** The design must allow for de-energized maintenance of any component of the station with a minimum of half the station remaining energized i.e. serving load.

**Specific items** to incorporate in design:

1. Require eight - 12kV feeders i.e. four on each bank.
2. Feeders to be in conduit systems and terminate at the north and south property line of the station in vaults. Maximum two feeders per vault.
3. Cables (if used) from transformer to 12kV distribution structure to be in conduits.
4. Strain relief on 12 kV transformer bushings.
5. Eliminate non-required components of the 60 kV structure. Consider replacing oil circuit breakers with SF6.
6. Reroute 60 kV lines as may be necessary (one in, one out).
7. Install oil retention system for all oil filled equipment.
8. Control building must include HVAC system and toilet facilities.
9. Determine need for station capacitor banks (relocate to other station or place on distribution system).
10. All relays to be solid state. Feeders to include reclosing relays.
11. Evaluate transformer condition to determine if replacement is warranted.
12. Reconstruct phone service for voice and SCADA to meet PacBell's requirements.
13. Existing RTU loaded to capacity, may require replacement.
14. Review, and modify as required, station security, i.e. infrared detection, fencing, step and touch potential, etc.
15. Review and modify ground grid system, as needed.
16. Consider installing oil filtration system on transformer load tap changing equipment.
17. Station light and power to be from two independent sources with transfer switch.

RESOLUTION NO. 2000-95

A RESOLUTION OF THE LODI CITY COUNCIL AUTHORIZING  
THE CITY MANAGER TO EXECUTE A PROFESSIONAL  
SERVICES CONTRACT WITH POWER ENGINEERS, INC., FOR  
AN ENGINEERING STUDY FOR KILLELEA SUBSTATION

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BE IT RESOLVED, that the Lodi City Council hereby authorizes the City Manager to enter into a Professional Service Contract with Power Engineers, Inc., for an engineering study to determine a feasible cost-effective rebuild option for the Killelea Substation upgrade project in the amount of \$32,000.00.

Dated: June 7, 2000

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I hereby certify that Resolution No. 2000-95 was passed and adopted by the Lodi City Council in a regular meeting held June 7, 2000 by the following vote:

AYES: Council Members – Hitchcock, Land, Nakanishi, Pennino  
and Mann (Mayor)

NOES: Council Members - None

ABSENT: Council Members - None

ABSTAIN: Council Members - None

  
JACQUELINE L. TAYLOR  
Interim City Clerk

2000-95